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VIEWS, NEWS AND INTERVIEWS.

"My friend Meekin, although an inventor of some ability, is an abnormally lazy man," remarked one of Mr. Edison's assistants. "He devotes his inventive genius chiefly to schemes for increasing his comfort and lessening his work. This Summer he has had an electric fan on top of his roller desk. It was an exertion for Meekin to reach up and turn the switch to start the fan, so he rigged up an automatic switch which turned on the current when he rolled up the top of his desk and turned it off when he shut the desk. He had an arrangement of pulleys and weights which automatically opened his desk when he had unlocked it. His only exertions, then, in connection with his desk, were to insert the key in the hole, turn it, pull it out and sit down. The top rolled up, the fan started and the breeze was right on tap. He pushes an electric button and calls the office boy when he wants his desk shut, but he's working on a scheme now by which he hopes to be able to close his desk simply by pushing the button that calls the boy."

The Lighthouse Board, through Captain W. S. Schley, is testing a submarine telephone in New York Bay connecting the Scotland Lightship with the shore. It is the invention of Prof. L. Blake, of the Kansas University.

When George Westinghouse, Jr., had invented his air brake he took it to Commodore Vanderbilt in the hope of getting him sufficiently interested in it to adopt it on the New York Central Road. The old Commodore went right on with his correspondence while Westinghouse explained how by an air pressure of 30 pounds to the square foot the brake was applied by the engineer, and when he finished he waited patiently for the verdict. The old Commodore raised his head long enough to jerk out: "What's that you say about air?"

Westinghouse told him.

Looking him steadily in the face, the old man replied in freezing tones: "That will do; I have no time to waste with a d—d fool."

Then Westinghouse went to President Tom Scott, of the Pennsylvania Railroad, and so impressed him that the road adopted the brake. Other roads followed suit and the inventor soon achieved fame and fortune.

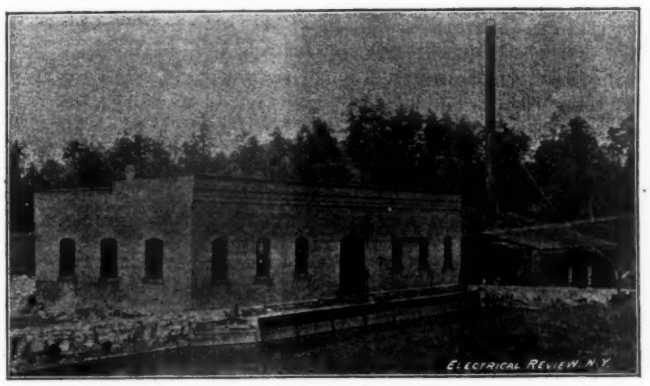


FIG. 1.—WATER AND STEAM POWER HOUSE, HOOSICK RAILWAY COMPANY.
(See page 142.)

When that time had arrived he one day received a letter from Commodore Vanderbilt asking him to call at the Central's office. Mr. Westinghouse's reply was terse and to the point. He simply wrote:

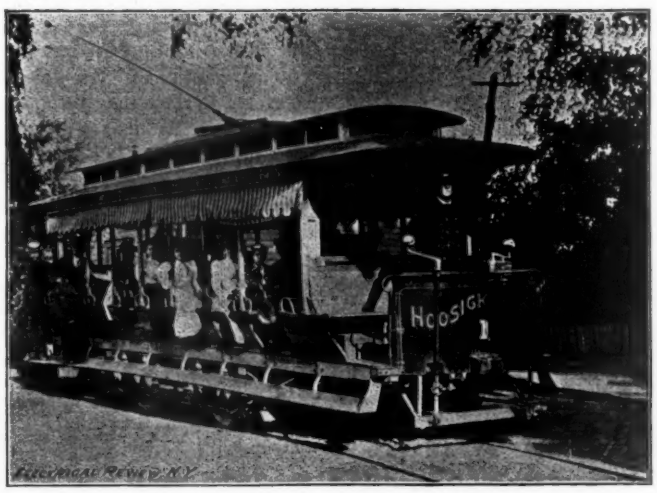


FIG. 2.—TEN BENCH OPEN MOTOR CAR, HOOSICK RAILWAY COMPANY.

"I have no time to waste with a d—d fool."

The decision in favor of the expediency of employing electricity for turning the turrets of our war vessels now under construction and not too far advanced for the substitution of this power in the place of steam, is interesting as another gain for the more modern motor. The possibility of so doing has long been understood, but the final result reached seems to have been due to the experiments made at League Island Navy Yard on one of the single turret monitors, a relic of the Civil War. The question of the placing of the dynamos on a naval vessel has also been carefully studied and it is found that, taking into consideration their security and that of their engines from injury, together with the least effect possible on the compass and the best distribution of their power to all parts of the vessel, and, finally, the absence of free steam and moisture, the dynamo room should be beneath the water line, near the center of the vessel and near the boilers.

THE "FEEDER AND MAIN" PATENT DECLARED VOID.

THE UNITED STATES CIRCUIT COURT OF APPEALS DECIDES AGAINST GENERAL ELECTRIC IN FAVOR OF WESTINGHOUSE.

JUDGE ACHESON REVERSES THE DECISION OF THE CIRCUIT COURT —A FINAL DECISION IN THIS FAMOUS CASE OPENS THE FIELD TO ALL MANUFACTURERS—THE "FEEDER AND MAIN" PATENT AND ITS CLAIMS—INTERESTING TESTIMONY IN THE SUIT.

Judge Acheson filed an opinion in the United States Circuit Court of Appeals at Philadelphia on September 12 in favor of Westinghouse, Church, Kerr & Company in the suit for infringement of patent brought by the Edison Electric Light Company. The suit came up last March upon appeal of Westinghouse, Church, Kerr & Company from the decision in the New Jersey Circuit Court, under which they were enjoined from infringing on one of the patents owned by the Edison Electric Light Company. The appeal was from an interlocutory decree granting the injunction.

This suit was brought by the Edison Electric Light Company, who were the complainants, against Westinghouse, Church, Kerr & Company, who were the defendants. The original bill was filed in December 22, 1886, and an amended bill was filed in the name of the same complainant, the Edison Electric Light Company, on June 15, 1887. The answer was filed November 19, 1889, a plea having in the meantime been filed, which was by agreement of counsel withdrawn and the answer substituted for it.

A replication in the usual form was filed November 29, 1889, and the answer was amended by consent of the parties by the order of the court.

This suit was brought in the United

States Circuit Court, District of New Jersey, for an alleged infringement of Letters Patent No. 264,642 granted to Thomas A. Edison for an electric distribution and translation system by reason of the construction and operation of an electric light plant at the city of Trenton, N. J., by the defendant, Westinghouse, Church, Kerr & Company, a New Jersey corporation, the construction and operation of said plant being the only infringement attempted to be proved against the defendant.

The People's Electric Light Company, the local organization, were not in any way a party to this suit.

The patent relates to systems of distributing electricity and specifically to what is known as the "multiple-arc" system of distribution as distinguished from the "series" system, both of these general systems having admittedly been well known in the art long prior to the date of the patent.

The particular subject matter with which the patent purports to deal is electric pressure or tension, and the invention covered by the patent purports to provide a remedy for the drop in electrical pressure, which is caused by the resistance of the main conductors to the flow of electric current through them, and it becomes essential, in order to clearly understand the patent, that as lucid an idea as possible should be obtained concerning the existing ideas of electric pressure and how the resistance of the conductors produces a drop in such pressure or tension.

Dr. Morton and Mr. Pope endeavor to show by a voluminous mass of testimony and drawings, the close relationship which exists between the so-called electric pressure and the pressure from gas mains. Throughout the testimony may be seen how the resistance of the pipes to the flow of gas is compared to the resistance caused by the passage of the current through the copper conductor. And it is this difficulty which the said patent purports to obviate. The patentee prescribes a remedy and proposes for the difficulty as follows:

"To obviate the difficulty (that is, the drop in the pressure due to the resistance of the main conductors), I provide feeding conductors which extend from the generator or generators to the main conductors of the lamp or consumption circuit or circuits, said feeding conductors not having any translating devices connected therewith and being connected with the main conductors of the consumption circuit or circuits at the center, ends or other points on such main conductors."

And further on in his specifications he states how the main conductors of the consumption circuit are to be proportioned.

The main point brought out in the specification was that the circuit consists of two essential parts, the feeding conductors and the main conductors of the main consumption circuit. Aside from any consideration of the relative length, size or resistance of the two parts of this multiple arc circuit, it is obvious that there will occur in all conductors a progressive drop or fall of electric pressure throughout their entire length, as would be the case in any conductor conveying electric current, the conditions being similar with gas distribution.

The following were the claims in suit:

"1. A consumption circuit, in the main conductors of which the drop in tension is not sufficient to vary practically the candle-power of the lamps connected therewith, in combination with feeding conductors connecting the consumption circuit with the source of electrical energy, and having no translating devices connected therewith, the drop in tension upon such feeding conductors not affecting the relative candle-power of the lamps of the consumption circuit, substantially as set forth.

"2. A consumption circuit in the main conductors of which there is a definite small drop in tension not sufficient to vary practically the candle-power of the lamps connected therewith, in combination with feeding conductors connecting the consumption circuit with the source of electrical energy and having no translating devices connected therewith, the loss upon such feeding conductors being greater than upon the main conductors of the consumption circuit, substantially as set forth.

"3. The combination of a consumption circuit in the main conductors of which the drop in tension is not sufficient to vary practically the candle-power of the lamps connected therewith, with a feeding circuit having no translating devices, and extending from the source of electrical energy to the center of the consumption circuit, substantially as set forth."

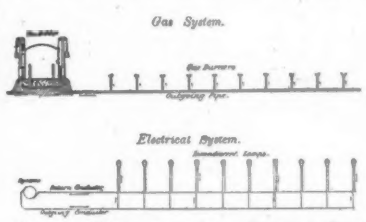


FIG. 1.—MULTIPLE ARC SYSTEM COMPARED WITH GAS SYSTEM OF DISTRIBUTION.

The complainant's experts desired to show that in addition to the specific limitations mentioned in the claims there were certain broad and general limitations which in their view sharply distinguish the circuit covered by these claims from anything that preceded it in the art, and in the testimony offered by Prof. Chandler, the fact that central station regulation was essentially part of the system claimed, was brought out; but on cross-examination Professor Chandler admitted that a *single circuit* supplying only a *single house* would be covered by the claims, and that if the generator were only of sufficient capacity to supply a single house or building, it would be a central station within the meaning of the patent.

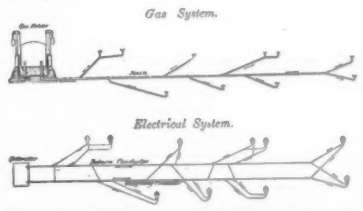


FIG. 2.—PRACTICAL ARRANGEMENT OF GAS AND ELECTRIC CONDUITS.

Sir William Thomson in his testimony refers to a plant in the Dundee Jute Mill and mentions it as one of the best embodiments known to him of the feeder and main system.

All through, the testimony of the defense was to show the great similarity between gas and water distribution and that of the electric distribution, according to the specifications mentioned in this patent.

Clegg's treatise of the manufacture and distribution of coal gas, a standard authority on the subject published in 1841, describes the use of independent mains very clearly. After describing the arrangement of the distributing mains it was stated that "their arrangement must be such as to allow of a perfect circulation of the gas and a nearly uniform pressure at the highest or lowest point."

Dr. Morton quotes this volume and furthermore points out the fact that if the cylinder be at any considerable distance from the works a smaller main with *increased* pressure may lead to it, its size being sufficient to equalize its discharge.

Almost innumerable quotations were brought in evidence to show the close relationship between this system and the conditions prior to this state of the art.

In order to show the great similarity between the gas systems heretofore used and the electrical system under discussion, we have here illustrated four diagrams of comparison. Each of these systems, as shown by the diagrams, has a central point of supply at which is located appropriate apparatus for the thing to be supplied and distributed and for producing the pressure requisite for forcing it through the conduits used for conveying and distributing it. In each system there will be noticed

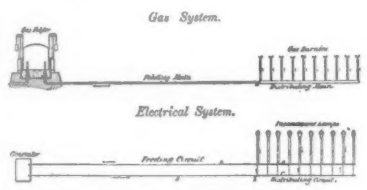


FIG. 3.—ANOTHER COMPARISON OF ELECTRIC AND GAS SYSTEMS.

a stream of current proceeding through the central point of supply through the main conduit as divided among the branch conduits, each one of which conveys a part of the stream or current to one or more of the points to be supplied.

The multiple-arc system, as represented in Fig. 1, is also called a parallel and receives its name from the fact that it comprises a multiplicity of branches, the term arc referring to the arc lamp, which was formerly the most common form of electric lamp known and would by the translating device come most readily to mind in connection with the electric lighting system.

The counsel for the defense endeavored to show that the system of gas distribution may with even appropriateness be called a parallel system for the same reason and it may also be appropriately called a multiple branch system.

In Fig. 2 the arrangements of the conduits actually adopted in practice in both systems is diagramatically

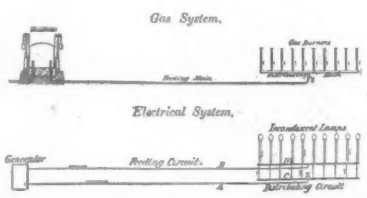


FIG. 4.—TRANSMITTING CONDUITS CONNECTED AT CENTER OF DISTRIBUTING MAIN. THIS IS FIG. 2 OF THE PATENT.

shown. Here it will be seen that the branches connected to the main conduits extend on each side in various directions, until finally the smallest branches terminate at and supply the lamps or burners.

In Fig. 3 another system is shown which is practically the same as that in Fig. 1, with the exception that the electric lights or burners are situated at quite a distance from the generator. The case in which the transmitting or feeding conduit is connected to and feeds into the distributing or service conduit at the center is illustrated for the two systems in Fig. 4. The same considerations apply to this case as to the preceding.

The principle of water distribution was also exhaustively brought out, and it was endeavored to show the analogies between this system and that of electric lighting.

The multiple-arc system has been largely used for electro-plating and electro-typing long prior to 18-0, and the difficulty in variations in pressure, due to the resistance of the conductors, had been encountered and obviated by substantially the same arrangement of circuits which is described in the patent in suit. Anyone who has ever examined the manner of connecting in electro-plating baths will recognize at once that instead of the outlets being electric lights, the anodes and kathodes serve in that capacity.

Khotinsky's French Patent No. 107,307, of 1875, which describes the multiple-arc circuit for electric lighting, was brought in as a part of the defendant's record.

The two British patents, Lane-Fox No. 3,988 and No. 4,626, were put in evidence by the defendant, and which refer to the proportioning of the conductors in electric circuit.

The main point of the defendant's line of action was to prove that the elements of the combination were all old.

Professor Chandler's testimony was quoted voluminously in the defendant's brief. Much stress was laid on the points brought out which served as a basis for the claim that the invention in question was no patentable novelty; it also being anticipated by Werderman and Khotinsky, also by gas and water systems.

Mr. Weston's testimony went to show that the systems described in the patent in question were anticipated by the distribution used in the art of electro-plating.

The defense questioned the importance of Sir William Thomson's testimony, claiming that that gentleman, although he has a great reputation, had a limited knowledge of the history and progress of the art of electric lighting and of constructing and operating electric light plants, notwithstanding the general impression to the contrary which might be derived from the statement of his direct examination.

The counsel for the defense claimed that his entire testimony, being based on the limited knowledge of the suit in question, was not of such great importance as the prosecution would have it.

The entire mass of testimony on the issue of infringement for the defendant was used for the purpose of showing that the essentials for in-

fringement were lacking, three claims being made to that effect.

It appeared that the real issue, so far as concerns patentability, was whether the single circuit covered by the claims in suit, when taken in its simplest form, involved a patentable novelty at the date of Mr. Edison's alleged invention. The defense claimed that the elements of the combination were all old and that there was no patentable novelty in the combination claimed, the prior uses and publications relating to gas and water distribution constituting a complete anticipation of the claims, and that the invention was anticipated by many other systems of distribution already existing.

Kerr & Curtis, of 120 Broadway, New York, were the successful attorneys for the defense, and to Mr. Leonard E. Curtis belongs the honor of winning this very important suit. Mr. Curtis has practically lived in this case for several years past and too much credit cannot be accorded to him for his success.

The General Electric Company regarded this patent as one of its most valuable assets and set great store in the firm conviction that it would be held valid to restrain competition. It was the General Electric Company against the rest of the field, as, if the patent had stood, none of their competitors, it is presumed, could have sold a dynamo or motor, because the machine could not be used without infringing the "feeder and main" patent. As it is now, the Westinghouse interests are in an especially fortunate position, for besides being free to use the "feeder and main" system in common with everyone else, they have the added glory of winning the victory.

The opinion has been expressed that the ending of this suit will act as a damper to further litigation on the part of General Electric and that the suits now pending on the incandescent lamp patents will not be pushed, and it is thought that no new ones will be instituted.

The following is the opinion of the court by Judge Acheson, holding the Edison "feeder and main" patent No. 264,642 to be void for lack of invention and reversing the decision of the Circuit Court:

UNITED STATES CIRCUIT COURT OF APPEALS

FOR THE THIRD CIRCUIT.

Westinghouse, Church, Kerr & Company, Appellant, *vs.* Edison Electric Light Company, Appellee.

Appeal from the Circuit Court of the United States for the District of New Jersey.

Before Acheson, Dallas and Butler, JJ.

Acheson, Cir. J.:

This suit was for the alleged infringement by the defendant of Letters Patent of the United States to Thomas A. Edison, No. 264,642, dated September 19, 1882, granted upon the application filed August 9, 1880, for an "electric distribution and translation system." After stating that the "invention relates to a method of equalizing the tension or 'pressure' of the current through an entire system of electric lighting, or other translation of electric force, preventing what is ordinarily known as a 'drop' in those portions of the system the more remote from the central station," the specification proceeds thus:

"As is well known from patents already granted me, and prior applications pending, I use in my system an electric light formed of a continuous incandescing conductor, large numbers of which are grouped into one system, supplied and regulated from a central station, main conductors leading from and to the central station, each lamp or translating device being in a derived circuit to the main conductors, the entire system being what is known as a 'multiple arc' system. From a central station the main conductors may proceed, and it is intended that they should, to a great distance, and supply a large number of translating devices. In such cases there is inevitably a difference in tension between various parts of the circuit, due to the resistance of the main conductors. This may be partially remedied by making the conductors very large near or at the station, gradually decreasing their size or conducting capacity; but such plan only lessens slightly the ratio of fall. To obviate the difficulty I provide feeding conductors, which extend from the generator or generators to the main conductors of the lamp or consumption circuit or circuits, such feeding conductors not having any translating devices connected therewith, and being connected with the main conductors of the consumption circuit or circuits at the center, ends or other points on such main conductors. From a central station several sets of such feeding conductors may run, each set feeding into its own lamp or consumption circuit, or all the sets feeding into a connected system of lamp or consumption circuits. It will be seen that the drop upon the feeding conductors has no effect upon the relative candle-power of the lamps of the system, the relative candle-power of the lamps being affected only by the drop upon the main conductors of the consumption circuit or circuits between the end of a set of feeding conductors and points most distant from any feeding conductors. In order to maintain practically the same candle-power throughout the system, the main conductors of the consumption circuit or circuits should be so proportioned that the drop in tension upon them shall not exceed a definite small limit; for example, five per cent. This drop will make a difference of less than a candle-power in all the 16 candle-power lamps of the system, which difference is not perceptible to the eye. Upon the feeding conductors, however, any loss can be made. This loss will be varied according to localities, and the relative cost of copper for conducting purposes, and horse-power for generation. This loss upon the feeding conductors, in large and extended systems, will generally be greater than upon the main conductors of the consumption circuit or circuits. It may be, for example, about 15 per cent; but circumstances might make it desirable to diminish the loss upon the feeding conductors down even as low as that upon the main conductors of the consumption circuit or circuits, or to increase the loss upon the feeders to more than 15 per cent. * * * When it is desired to use a few lamps near the central station, they may be placed upon a direct circuit therefrom, with resistance at the commencement or home end of the circuit sufficient to then reduce the tension of the current in such circuit so that it shall only be equal to that in the more distant circuits, and one or more such circuits may be combined with the circuits before described. When large buildings or blocks of buildings using many lamps are to be supplied, it may be desirable to lay, therefor, separate feeders insulated from each other. Where several central stations are used in a city, each having feeding conductors leading to lamp-circuit conductors of the description before noted, it may be advisable to connect the feeding circuits of all the stations, equalizing the tension or pressure throughout the entire system of the place where the central stations are located."

The illustrative drawings show different applications of the general form of circuit described in the specification. The patent has six claims, but the defendant was charged only with the infringement of the first, second and third claims, which are as follows:

"1. A consumption circuit, in the main conductors of which the drop in tension is not sufficient to vary practically the candle-power of the lamps connected therewith, in combination with feeding conductors connecting the consumption circuit with the source of electrical energy, and having no translating devices connected therewith, the drop in tension upon such feeding conductors not affecting the relative candle-power of the lamps of the consumption circuit, substantially as set forth.

"2. A consumption circuit, in the main conductors of which there is a definite small drop in tension, not sufficient to vary practically the candle-power of the lamps connected therewith, in combination with feeding conductors connecting the consumption circuit with the source of electrical energy, and having no translating devices connected therewith, the loss upon such feeding conductors being greater than upon the main conductors of the consumption circuit, substantially as set forth.

"3. The combination of a consumption circuit, in the main conductors of which the drop in tension is not sufficient to vary practically the candle-power of the lamps connected therewith, with a feeding-circuit having no translating devices, and extending from the source of electrical energy to the center of the consumption circuit, substantially as set forth."

For the proper determination of this case it is essential that the subject matter of these claims should be clearly understood. This patent does not deal with the complicated general problem of the distribution of electricity and the subdivision of the current for the purpose of domestic illumination. The patent is not for an incandescent lamp, or for a dynamo for generating electricity, or for the arrangement of the lamps in multiple-arc, or for indicating and regulating devices for controlling the current from a central station, singly or combined. The patent deals with the one particular difficulty of drop in tension or fall of pressure—loss of electro-motive force, due to the resistance of the conductors to the electric flow. To remedy the evil effect therefrom, the patentee provides special conductors for the transmission of electricity, extending from the generator to the main conductors with which the lamps are connected and from which they are served. The patent is for a specific arrangement and proportioning of the two sets of conductors which together constitute the complete circuit.

The claims in question are perfectly clear and definite. Each claim is for a combination consisting of two constituents, namely, a consumption circuit in the main conductors, of which the drop in tension is not sufficient to vary practically the candle-power of the lamps connected therewith, and feeding conductors (a feeding circuit) having no translating devices thereon, uniting the consumption circuit with the source of electrical energy. Any electric consumption circuit, the main conductors of which are so proportioned that the drop in tension therein is not sufficient to vary practically the candle-power of its lamps, in combination with feeding conductors on which are no translating devices, falls within the scope of the claims. Plainly, each of these claims is for a single circuit composed of a pair of transmitting conductors and a pair of distributing conductors having the specified characteristics without regard to any other like circuit. The gist of the alleged invention is in the combination and proportioning of the two parts of the circuit, and not in the scale of use.

Contrary to these views, the Circuit Court was of the opinion that certain unexpressed qualifications are to be incorporated into each of the claims by virtue of the concluding words, "substantially as set forth." After discussing the specified limitations, the Court said:

"But this statement of the claims would be highly inaccurate if permitted to stand alone. Other limitations must be regarded. Not only are the circuits, feeding and consumption, unique in their special characteristics, but, as well, are jointly applicable to the lightning by incandescent lamps, in multiple arc, of large areas, of which portions or parcels are very distant or remote from a central station, from which, however, emanates complete control. It is true that these latter limitations are not expressed in terms in the claims under consideration, or in either of them. But, in draughting the claims, Mr. Edison, by the words used, clearly referred to the descriptive phraseology of the specifications of his invention preceding them."

Accordingly, the Court construed these several claims as involving the lighting of a "large territory" by the use of "large numbers" of incandescent lamps, and as implying central station regulation whereby variable drop in tension in remote parts of the system may be controlled. But, in our judgment, these limitations are inadmissible. The fact is, pending the application for this patent, it was sought to amend the specification and insert a new claim by the introduction of the matter of central station regulation, but the Patent Office rejected the proposed amendment for the assigned reason that "it describes and claims an invention not even hinted at in the original specification nor shown in any of the drawings."

While central station regulation is incidentally referred to in the introductory part of the specification, it is not described at all, and clearly is no part of this alleged invention. The only described means to secure equality of pressure between the lamps of a circuit near the central station and the lamps of a circuit more remote therefrom are resistance coils put in the supply conductors of the near circuit. This device is covered by the fifth claim, infringement of which is not charged.

The claims in question are unambiguous and exact. Upon well settled principles, then, limitations other than those expressed are to be excluded (*Railroad Company vs. Mellen*, 104, U. S. 112; *Yale Lock Company vs. Greenleaf*, 117, U. S. 554; *White vs. Dunbar*, 119, U. S. 47, 52). As was said in the last cited case, "the claim is a statutory requirement, prescribed for the very purpose of making the patentee define precisely what his invention is; and it is unjust to the public, as well as an evasion of the law, to construe it in a manner different from the plain import of its terms." The claims here, we think, were purposely framed broadly, so as to cover the simplest form of the alleged invention.

The claims with which we are concerned, as we have seen, are each for a combination of two elements, a consumption circuit and feeding conductors having respectively the peculiar properties specified. The primary question for solution, then, is whether it involved invention in a patentable sense to combine a circuit for feeding only with a consumption circuit, the main conductors of which are so proportioned as to maintain such uniformity of pressure upon them that there is practically no variance in the candle-power of the lamps connected therewith.

Now, a claim for a combination carries with an implication that the separate elements are old. Says Mr. Justice Bradley, speaking for the Court, in the case of *The Corn-planter Patent*, 23 Wall., 181, 224: "Where a patentee, after describing a machine, claims as his invention a certain combination of elements, or a certain device, or part of the machine, this is an implied declaration, as conclusive, so far as that patent is concerned, as if it were expressed, that the specific combination or thing claimed is the only part which the patentee regards as new." In the present instance the positive proofs accord with the implication. Most certainly the patent in suit discloses no new means either for transmitting a current of electricity or for equalizing pressure upon the consumption circuit.

It is to be noted that the patent leaves it altogether to the judgment of the electrical engineer, or contractor, to determine the relative lengths of the two parts of the combined circuit and the proper thickness of the conductors. As to these points no definite instructions are given. Undoubtedly, it was well known prior to the alleged invention that a large quantity of electrical energy could be transmitted a considerable distance by a conductor of small size. Now, with respect to the loss of pressure upon the feeding conductors—which loss depends upon the thickness of the conductors—the specification tells us that "this loss will be varied according to localities and the relative cost of copper for conducting purposes and horse-power for generation." It is said that in large and extended systems this loss would generally be greater than the loss upon the main conductors of the consumption circuit, and "may be, for example, about 15 per cent;" but that circumstances might make it desirable to diminish the loss down even as low as that upon the main conductors of the consumption circuit, or to increase the loss upon the feeders to more than 15 per cent. Thus is it left where, indeed, it properly belongs—to the intelligence of the electrical engineer to select feeding conductors of larger or smaller diameter, depending upon the comparative cost of copper and of power, or upon some special circumstances.

Of a truth, the feeding conductors of the patent are nothing more than the ordinary supply wires running from the source of the electrical energy. The proper function of such conductors being to transmit the electric current to the point where it is to be utilized, as a matter of course they have no "translating devices connected therewith." The statement in the specification—"It will be seen that the drop upon the feeding conductors has no effect upon the relative candle-power of the lamps, being affected only by the drop upon the main conductors of the consumption circuit or circuits between the end of a set of feeding conductors and points most distant from any feeding conductors"—is the mention of an obvious fact. Indeed, it is put as a self-evident proposition. That no loss upon the supply part of the circuit can affect the relative candle-power of the lamps upon the consumption part of the circuit is a quality inhering in the circuit by the very nature of things. It is a necessary incident of any circuit, part of which supplies the current and part of which distributes it.

The specification states that, "in order to maintain practically the same candle-power throughout the system, the main conductors of the consumption circuit or circuits should be so proportioned that the drop in tension upon them shall not exceed a definite small limit—for example, five per cent," but gives no information whatever how that is done. This silence is highly significant. The specification assumes that to secure uniformity of electrical pressure, and thus uniformity of effect, is a matter of common knowledge among those skilled in the electrical art, as indeed it was. The drop or fall in tension or pressure in an electrical current in its passage through a conductor was an observed and well-understood phenomenon long prior to the year 1880. It was known that its cause was the resistance offered by the conductor to the flow of the current, and the laws governing the flow of electricity and the drop in tension had been ascertained and published, and were perfectly familiar to all skilled electricians. They understood the effect upon the drop in tension of variations in the size and length of the conductor and of changes in the electro-motive force of the generator; and the ascertainment of the proportions to be given to a conductor to secure a definite fall in pressure with a given current was a mere matter of calculation, to aid which formulas had been worked out.

In the art of electroplating as practiced long before 1880, we find an arrangement of circuits substantially the same as that of the patent in suit. Here a large number of articles to be plated simultaneously are suspended in the bath by separate wires attached to a metallic rod placed across the top of the tank; that is to say, the articles are arranged in multiple-arc with repect to the electric current. The rod is supplied with the current by conducting wires which connect the rod with the dynamo, and the current divides among the suspended articles. It will be perceived that here one part of the circuit is used exclusively for transmitting the current and the other part for distributing it. Equality of electric pressure among the articles to be treated is essential to good work, and, in fact, the distributing rods were made of such size that any material fall in pressure was avoided.

Turning now to the Khotinsky French Patent of 1875, which relates to the art of electric lighting, we discover that it shows and describes a circuit of feeding and consumption parts in combination, identical in form with that of the patent in suit. The lamps of Khotinsky's system are incandescent lamps, and they are arranged in multiple arc. He shows a magneto-electric machine located "in the center of this system or at any other point." From the magneto-electric machine run two "conducting wires" with which no translating devices are connected. These conducting or feeding wires connect with the "main conductors" of the circuit with which all the lamps are connected. In his diagrams 1 and 3 the feeding conductors connect with the center of the consumption circuit and in diagram 2 at the end. Undeniably, Khotinsky's combined arrangement of feeding conductors and distributing conductors is precisely the arrangement of the patent in

suit. Nothing indeed is said by Khotinsky about proportioning the main conductors of the consumption circuit so as to prevent injurious drop in tension. It was, however, wholly unnecessary for him to say anything upon that subject. All that was needful to overcome the difficulty due to drop in tension was to make the main conductors of the consumption circuit of proper thickness. The laws governing the flow and distribution of electricity in conductors were perfectly well know to electricians at the date of Khotinsky's patent, and any electrical engineer of ordinary skill then called on to construct a circuit of Khotinsky's system, it is to be assumed, would have acted in accordance with common electrical knowledge, principles and practice; in other words, he would have made the main conductors of the consumption circuit sufficiently large to be of practical utility.

How can it be affirmed that it would require invention simply to proportion Khotinsky's circuit in the manner contemplated by the patent in suit, to make his transmitting wires and distributing conductors, respectively, of suitable size to perform their intended functions?

Now, it is quite true that prior to the year 1880, electric lighting for ordinary domestic purposes was not an accomplished fact. But this was not for lack of anything shown by the patent in suit. The great *desideratum* was a practical incandescent lamp. Such a lamp, with a filamental carbon conductor of high resistance and burning with a very small amount of current, was devised in or about the year 1879, and it solved the problem of the practical subdivision of the electric current for incandescent lighting. The principle of this lamp was pronounced by Mr. Justice Bradley, in the *Consolidated Electric Light Company* vs. *McKeesport Light Company*, 40 Fed. Rep., 21, 29, to have been "the grand discovery in the art of electric lighting, without which it could not have become a practical art for the purpose of general use in houses and cities." Such were the views which prevailed in the Second Circuit in the case of the *Edison Electric Light Company* vs. *United States Electric Lighting Company*, 47 Fed. Rep., 454; 52 Fed. Rep., 300, where it was decided that Mr. Edison was the first and original inventor of this lamp.

Under the proofs we cannot assent to the suggestion that the alleged invention here in question supplied a long-felt want, or met a difficulty generally recognized in the art as a serious hindrance to the distribution of the electric current. In fact, prior to the application for this patent no incandescent electric lighting plant had been built. There had been no occasion to erect such plants, for no practically successful incandescent lamp had yet been furnished to the public. Hence, electrical engineers had not been called upon to deal practically with the problem of drop in tension in the construction of such plants. In truth, the feeder and main system of distribution came naturally, in the ordinary progress of the art of incandescent electric lighting, as and when needed.

In his Cantor lectures of February, 1885 (put in evidence by the plaintiff below), Prof. George Forbes, speaking of this feeder and main system, well said: "It is a result which would certainly have been arrived at by any one who thoroughly and intelligently worked out the problem." True, he added that, so far as he could discover, Mr. Edison "was the first, by a long time, to hit upon this cure for the evil." But this latter statement is without significance when we reflect that a practical incandescent lamp, without which domestic electric illumination was impossible, was invented so short a time before the application for this patent, and that, when the occasion for its use actually arose, the feeder and main system was forthcoming.

It is a great mistake, as the proofs demonstrate, to attribute to the patent in suit the merit of having solved the problem of economically supplying the requisite current for extensive use to circuits covering large areas, portions of which are at great distances from the source of electrical energy. Whatever of economy in copper may result from the plan of the patent is confined altogether to the transmitting conductors, and the cost of copper restricts the use of this system to comparatively narrow limits. The extension of incandescent electric lighting over large areas is really due to subsequent inventions. Conspicuous among the more recent discoveries and improvements which have brought incandescent lighting into extensive and common use is the converter or alternating current system, whereby the electric current is transmitted from the generating station to a very great distance at an extremely high pressure, and is converted at the points of distribution with the low pressure currents required by the incandescent lamps.

The multiple arc or derived-circuit system of distribution being confessedly old, and the high resistance incandescent lamp having been devised to provide "feeding conductors which extend from the generator or generators to the main conductors of the lamp of consumption current," was, it seems to us, an obvious engineering expedient. Then, as already shown, the proper proportioning of the two parts of the combined circuit involved only the exercise of the common knowledge and skill of the electrician. The facts, we think, clearly bring this case within the principles announced by the Supreme Court in the case of *Hollister* vs. *Benedict, etc., Company*, 113 U. S., 59, and in kindred cases. The plan of electric distribution covered by the claims in question is not "the creative work of that inventive faculty which it was the purpose of the Constitution and patent laws to encourage and reward." To sustain these claims would be to sanction a monopoly in that which belongs to the public.

In announcing this conclusion we cannot do better than quote some observations of the Supreme Court which apply with great force to this case, as we read the proofs. In *Atlantic Works* vs. *Brady*, 107 U. S., 192, 199, the Court said:

"The process of development in manufactures creates a constant demand for new appliances, which the skill of ordinary head-workmen and engineers is generally adequate to devise, and which, indeed, are the natural and proper outgrowth of such development. Each step forward prepares the way for the next, and each is usually taken by spontaneous trials and attempts in a hundred different places. To grant to a single party a monopoly of every slight advance made, except where the exercise of invention, somewhat above ordinary mechanical or engineering skill, is distinctly shown, is unjust in principle and injurious in its consequences."

The appellant maintains that under the ruling of the Supreme Court in the case of *Miller* vs. *Eagle Manufacturing Company*, 151 U. S., 186, the first, second and third claims of the patent in suit are void, because of the grant of an earlier patent to Mr. Edison, No. 239,147, dated March 22, 1881, which dealt with the evil of drop in tension, and provided a remedy by feeding conductors, having no lamps thereon, connected with the mains around the central generating station and so proportioned as to secure equal electrical pressure throughout the entire system. It is contended that the invention described and claimed in the earlier patent is for one form of the alleged invention described in the latter patent and covered by the first three claims thereof, and that no one could use the invention of the earlier patent without infringing these later claims. The question thus raised is a serious one, but we do not deem it to be necessary to consider it, inasmuch as the views we have expressed upon the other branch of the case are decisive.

The decree of the Court below is reversed and the cause is remanded, with directions to enter a decree dismissing the bill of complaint, with costs.

Kerr & Curtis, 120 Broadway, New York, were the solicitors for the appellant. Edmund Wetmore and Leonard E. Curtis were counsel for the appellant.

PERSONAL.

Edgar K. Ray has been elected president of the Woonsocket Street Railway Company, *vice* James P. Ray, deceased.

Mr. Edo E. Mercelis, a rising young attorney of this city, has moved his office from 69 Wall street to the Farmers' Loan and Trust building at No. 22 William street.

Mr. Chas. N. Morgan, a prominent corporation lawyer of New York city, well known in electrical circles, has taken a fine suite of offices in the building of the Farmers' Loan and Trust Company, at 22 William street. Mr. Morgan was formerly at 69 Wall street.

Mr. Thos. Ahearn and family, of Ottawa, Canada, arrived from Europe on the steamship "State of Nebraska" last week en route for home. Mr. Ahearn is a member of the firm of Ahearn & Soper and has recently been elected president of the Consolidated Electric Light and Street Railway Company, of Ottawa.

Mr. S. A. Barton and brother, Mr. David Barton, were New York visitors a few brief hours last week, returning to Boston from the G. A. R. encampment at Pittsburgh. Mr. S. A. Barton, whose important electrical work in the early days of the Thomson-Houston company is well known, fought with the boys in blue at a very early age.

Mr. Wm. S. Hine, of the Wallace Electric Company, Chicago, was in New York on Monday of last week. Mr. Hine reports that business with his company is very satisfactory. The Wallace Electric Company has recently taken the Chicago agencies for the well known Ward arc lamps and for the specialties made by the Hope Electric Appliance Company, of Providence, R. I.

President M. J. Francisco and Secretary Geo. F. Porter, of the National Electric Light Association, paid the ELECTRICAL REVIEW office a pleasant call last Tuesday. Mr. Francisco is determined that the next meeting of the association shall be up to the high standard of former gatherings. He is also president of the Rutland, Vermont, Electric Light Company, and has brought the affairs of this company to a very successful point.

AN EARLY INVENTOR.

DID HE REFER TO STEAM OR TO ELECTRICITY?

The following petition, found among the Massachusetts Archives (CXXVIII. 60) at the State House, and published in the Boston *Journal*, suggests a wide range for the imagination. It bears no date, but as Andros was deposed on April 20, 1689, it must have been written before that time. Did Mr. Talbot, the writer, have in mind the application of steam to machinery? Or was it electricity that propelled his "engine?"

To Sr Edmond Andros, Knigt Captain Generall & Governer in Cheif over this his Majestys Territorys of New: E.

The humble petition of Christopher Talbot Turner in Boston

Humbly sheweth

That whereas your petitioner with great pains & expence hath found out an Engine usefull for divers trades men as turners ropemakers smiths & all sorts of mills for corn sider sawmills & almost any thing that is to be done by wheels with sails & also hath discouered to make a boat sail against the wind & tide & sundry other things with more ease & expedition then hath bin discovered hitherto either in Europe or America. & whereas his Majesty & his royall Predicessors haue at all times been pleas'd graciously to Encourage all undertakings of this nature yt whosoever finds out any new engine or invention profitable for ye commom good to grant their letters patent for the sole use therof.

Therefore yr petitioner is humbly bold & beggs yt yr Excelency will be pleas'd to grant him yr letters pattents for ye sole use & improuement of the said Engine in these his Majesties territories of New: E. for 14 years (as is accostomed) & yt no other person shall make use of the same or any such like without yr petitioners consent.

who is in duty bound & shall for ever pray.

CHRISTOPHER TALBOT.

New Orleans Electrical Society.

At a meeting of the New Orleans, La., Electrical Society held last week the new rules and requirements of the Underwriters' Inspection Bureau were discussed.

TO MEET IN CLEVELAND.

THE NATIONAL ELECTRIC LIGHT ASSOCIATION WILL HOLD ITS NEXT MEETING IN CLEVELAND, OHIO, FEBRUARY 19, 20 AND 21, 1895.

President M. J. Francisco, of the National Electric Light Association, called a meeting of the executive committee of this association, which was held at the Hotel Brunswick, New York city, last week. The chief reason for the meeting was to decide where to hold the next convention, and after a general discussion by the members of the committee and the distinguished newspaper men who were present by sufferance, it was unanimously voted to go to the beautiful city of Cleveland on the banks of the great lake. The date decided upon was February 19, 20 and 21.

President Francisco nominated Mr. George F. Porter as secretary and treasurer and Mr. Cyrus O. Baker, Jr., as chairman of transportation for the association for the ensuing year. These nominations were confirmed, notwithstanding some irreverent and zealous opposition on the part of several of the aforesaid non-voting newspaper men, who were present by sufferance on account of the brainy advice they could give on all questions.

A very enjoyable dinner was discussed and a good deal of excellent work looking towards the further advance of the cause of the National Electric Light Association was presented and taken under advisement. The silver punch bowl which was presented by the National Electric Light Association, at the Washington meeting, to Mr. Cyrus O. Baker, Jr., was in evidence on this occasion and contained a very refreshing and delicate brand of lemonade, supplied and concocted by the owner.

Among the gentlemen present were the following: President, M. J. Francisco, Rutland, Vt.; A. J. De Camp, Philadelphia; George M. Phelps, New York; H. J. Smith, New York; Cyrus O. Baker, Jr., New York and New Jersey; Chas. W. Price, New York; ex-president James I. Ayer, New York and St. Louis; Secretary George F. Porter, New York; Edw. Flirt Peck, Brooklyn; W. D. Weaver, New York; and Mr. Metcalf.

Brooklyn Electrical Society.

At a meeting of the Brooklyn, N. Y., Electrical Society, held last week at the home of the secretary, Arthur A. Fisk, a paper entitled, "The Evolution of Electric Traction," was read. The paper was submitted by W. C. Burling, and read by William C. Otten. Previous to the reading of the paper, 28 propositions for membership were received.

Mr. Frank H. Stewart, 41 North Seventh street, Philadelphia, reports a good present business and a promising future trade. Mr. Stewart handles none but reliable electric appliances. His list of agencies include those for the Perkins Electric Switch Manufacturing Company, the Dayton Fan and Motor Company and the Waterhouse-Gamble arc lamps.

TUNNEL VENTILATION.

BY H. G. TUCKERMAN.

The recent disastrous collision in the Hoosac Tunnel, on the Fitchburg road, by which several lives were lost and which opens up possibilities of far greater danger, serves to call attention to the necessity of proper ventilation of tunnels and its value as a safeguard to the traveling public. The engineer of the fast freight was unable to distinguish the lights on the standing train, owing to the volumns of dense smoke which filled the tunnel, and crashed into the rear car at full speed. Had the accident happened to a passenger instead of a freight train the results would have been much more serious, and a tremendous loss of life would inevitably have followed.

That efficient ventilation, even of the largest tunnels, is practicable, has been thoroughly demonstrated by the work of the Davidson Ventilating Fan Company, of Boston, Mass., and in this connection two of their recent installations are worthy of notice, comprising as they do two of the largest radial fans ever constructed for this purpose.

The first of these was put in for the Pennsylvania Railroad Company for the ventilation of their 3,600 foot tunnel under the city of Baltimore, and is capable of clearing the entire tunnel of smoke within five minutes after the passage of a train.

When the fact is taken into consideration that this tunnel is nearly a mile in length, with an average height of 17 feet and a width of 35 feet, and that the air to be removed is estimated to be about 1,250,000 cubic feet, the enormous power of the fan begins to be realized.

The fan is located as nearly as possible midway between the portals, and the main ventilation shaft is of ornamental brick and stands 100 feet high. It is 15½ feet in diameter at the base, and merges from a round to a square outlet of the same area at the top. The fan is placed at the bottom of the stack on a vertical shaft, and is driven by a 75 horse-power electric motor. The combined weight of the fan and shaft is two and a half tons, and the fan is driven at 130 revolutions per minute. The power plant for generating the current is nearly a mile distant, and is located on the company's property near the entrance to the first tunnel.

The perfect success of this installation, and the satisfactory manner in which it accomplished the work required of it, led the Terminal Railroad Association, of St. Louis, Mo., after a thorough investigation, to place an order with the Davidson Ventilating Fan Company for the largest fan of its kind ever built, for use in their tunnel between the St. Louis bridge and the Union Depot in the city of St. Louis.

This tunnel is 4,095 feet in length, has several sharp curves and is particularly difficult to ventilate, from the fact that it is practically two tunnels, a dividing wall running the entire length with the exception of the space left for the central air chamber, where the fan is located.

The main ventilation shaft running from this air chamber is built of boiler iron and is 37 feet in diameter at the base, 15 feet in diameter at the top and 130 feet in height. The fan is located at the foot of this stack. It is 20 feet in diameter, has a blade trend seven feet two inches deep and weighs nearly 30,000 pounds. It is driven at a speed ranging from 70 to 100 revolutions and has a capacity of removing 88,000 cubic feet of air per minute.

It is driven by a Herreshoff compound double cylinder non-condensing engine of a maximum capacity of 190 horse-power, the same one, in fact, that was used in driving the older type of centrifugal fan, only 15 feet in diameter.

It is estimated that the amount of air to be removed in order to clear the tunnel of the smoke from any one train is 2,750,000 cubic feet, and this is accomplished in a little over three minutes.

This system of ventilation was originated and designed by the Davidson Ventilating Fan Company, and the adaptability of their radial fan for this class of work over any other make has been fully demonstrated by the results accomplished and the economy with which they can be operated. They feel that the success of the two installations mentioned should open up a field of large extent, and that, as soon as the benefits to be derived from perfect tunnel ventilation are fully understood and appreciated, this system of radial fans, driven by either electricity or steam power, will be very generally adopted for all tunnels of any considerable size.

St. Louis Union Station.

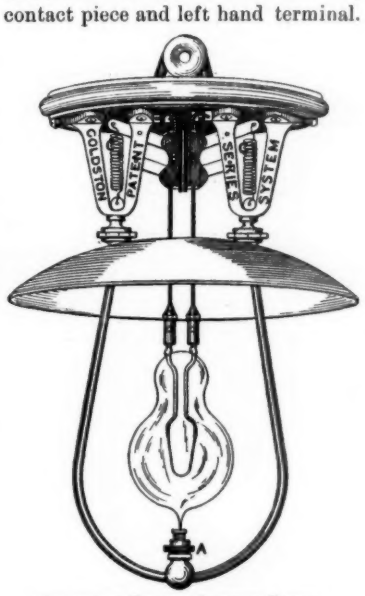
Probably the most important features of the New Union station at St. Louis and its outlying plant are its electrical equipments; no expense has been spared to have all the latest and best appliances embodied in its construction. With the exception of the heating, electricity has been utilized in every department. In addition to the lighting of the buildings, sheds and tracks, the elevators are run by electricity, the station is ventilated by electricity, the temperature, time and watchmen's clocks are regulated by electricity, and the signals for the movement of trains are governed by electricity. The construction work for the lighting, telephone, watchmen's clock system, etc., was done by E. G. Bruckman, of the Equitable Building, St. Louis, who originated the distribution of the lights, with regard to their effective location.

Chicago Electrical Concerns Scorched.

A fire occurred in Chicago at midnight on September 4 which burned out the Charles E. Gregory Company, dealers in electrical apparatus, and the Chicago Gas and Electric Fixture Company.

The "Goldston" System of Series Incandescent Street Lighting.

Mr. Goldston claims to have designed an apparatus which has been tried over a long period of time, though on a small scale, and has been found to be satisfactory. Our illustration is from the latest form of apparatus, a specimen of which was kindly placed at our service by the inventor, says the London *Electrical Engineer*. The reflector is insulated from the working parts. The action will be best seen by tracing the path of the current. Assume the apparatus in a normal condition. Assume the current to enter by the right hand terminal, it goes through the flexible wire of the right hand metal piece *B*, through the continuing flexible wire to the lamp terminal, by the carbon filament to the left hand flexible wire, contact piece and left hand terminal.



GOLDSTON SERIES STREET LIGHT.

The bottom of the lamp bulb is continued as a glass rod, and the position of the bulb can be adjusted by means of the screw *A*. For normal working it is adjusted so that the contact pieces *B B* are separated by an air space. Thus we have the force used in the adjustment opposed to the force exerted by the springs *C C*, whichever act to bring the surfaces of *B B* into contact. The breaking of the bulb or the glass continuation allows the springs to act. *B B* immediately make good electrical contact, and continuity of circuit is preserved from terminal to terminal. If the carbon is ruptured it is found that an arc is formed, and a little melted metal from the action of the arc on the carbon connections drops upon the point where the glass continuation joins the bulb and rupture takes place. In any case the arc which is set up travels up the stems, and in cracking the glass at the crown of the lamp, thus releasing the tension, the contact makers instantly come together. When no automatic regulation is provided to compensate for any lamp being cut out, the apparatus is sent out with carbon faces on the contact maker, a compensating resistance being thereby inserted simply and automatically. Everything seems exceedingly simple, and as trial has proved it satisfactory we may hope in the very near future of seeing a more extended use of series incandescent lighting.

American Institute of Electrical Engineers.

The eighty-ninth meeting of the Institute will be held at headquarters, 12 West Thirty-first street, New York city, on Wednesday, September 19, at 8 P. M.

A paper will be presented by Frederick Bedell, Ph.D., and Carl Kinsley, A. B., M. E., of Ithaca, N. Y., on "A Study of the Residual Charges of Condensers and Their Dependence Upon Temperature." As arranged with the authors, this paper will be read by title, but will be open for discussion.

A paper will also be presented by Mr. Elmer A. Sperry, of Cleveland, Ohio, on "The Electric Brake in Practice." This paper will be accompanied by practical demonstrations.

A meeting of western members for the reading and discussion of the above papers will be held on the same evening, September 19, at the Armour Institute, Thirty-third street and Armour avenue, Chicago, Ill.

Members of the American Society of Civil Engineers, American Society of Mechanical Engineers and Western Society of Engineers are especially invited to attend.

The August issue of the *Transactions*, containing the above papers, will be distributed previous to the meeting, but advance sheets will be mailed by the secretary upon application.

Advertising Catechism.

When is a good time to advertise?

Now.

When would you stop?

Never.

How much money would you expend?

A little more than you think you can spare.

Is that not putting it too strong?

No.

Why?

Because good advertising once begun increases your bank account, so that you can afford to double and treble your newspaper space.

Has not too much advertising sent many merchants to the wall?

Judicious advertising has never been the cause of a business failure, but it has been the cause of princely fortunes. Wildcat, indiscriminate advertising, coupled with loose business habits, has accompanied men into assignments. No modern store has ever made a big success that did not engage newspaper publicity.

The cross-examination is over.—*Progress.*

A Long Distance Scrap.

Jenkins—Well, sir, I gave it to that man straight, I can tell you. He is twice as big as I am, too, but I told him exactly what I thought of his rascally conduct right to his face, and I called him all the names in the dictionary and a lot of others as well.

Studds—And didn't he try to hit you, Jenkins?

"No sir, he didn't. And when he tried to answer back I just hung up the telephone receiver and walked away."—*Tid-Bits.*

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Another failure in electrical circles may be attributed to the fallacious idea that honest work can be successfully done at less than cost. It is always only a question of time when concerns thus managed must go to the wall.

THE FEEDER AND MAIN PATENT.

This patent has been finally declared void by the United States Circuit Court of Appeals. The electrical industry will now breathe easier. Other than to lop off a possible asset of the General Electric Company and to settle a disputed point of importance, the decision does not change the situation in the electrical field.

Had the decision been in favor of the owners of the patent, it would have proven a serious disturbing element and probably would have brought much disaster to all outside electrical interests.

The ELECTRICAL REVIEW does not believe that the decision should be taken as a blow at patents; it should rather be considered as favoring accurate patents that do not claim too much.

We hope in the future to see less time and money spent in patent litigation and more for improvements in manufacture and increase of business on the part of the leading companies.

There will be a general awakening of the storage battery manufacturers growing out of the refusal by the court to grant an injunction asked on the Brush patents against the chloride battery. This is always an interesting branch of electrical work, and we hope to see the most sanguine hopes of the storage battery advocates yet realized.

Mr. Leonard E. Curtis, who won the "feeder and main" patent suit for the Westinghouse interests, is the biggest man in the electrical field just now. He is a modest man but deserves his honors none the less.

Every pound of water power in New York State is now an object of interest. The success of long-distance transmission of electric power has brought this about. The degree of this success is now the chief question.

A Parisian chemist has invented a luminous face powder which, it is said, will prevent the ghastly appearance which beauty sometimes assumes under the penetrating rays of the electric light.

Baltimore is congratulating itself over the rapid growth of its suburbs, due to the extension of its trolley lines. There is an example here for other cities to follow.

The question of lighting electric railway cars with gas is just now a topic of much interest. It will show up at the Atlanta Convention, no doubt.

THE OLD TIMERS' AND MILITARY TELEGRAPHERS' MEETING.

THE FOURTEENTH REUNION HELD LAST WEEK AT BALTIMORE.

The fourteenth annual meeting of the Old Time Telegraph Association and the Society of the United States Military Telegraph Corps, and the joint reunion of the two organizations were held in Baltimore, Md., on the 12th and 13th insts. For several years past the Old Timers have been planning for a grand semi-centennial celebration of the birth of telegraphy in the monumental city, but, by some misunderstanding on the part of the officers of the Society, the fact that the proper day for the celebration was May 24 was overlooked. However, in matters of gracious and cordial hospitality, Baltimoreans never count months and years, and they were quite ready to welcome their visitors and join with spirit and enthusiasm in showing their appreciation of Morse's early achievement and its wonderful results. Besides this the 12th of September is, above all others, the Marylanders' day, for this is the anniversary of the battle of North Point, in which their citizen soldiery halted the triumphant army of Great Britain at the head waters of Chesapeake Bay and sent it flying back across the Atlantic. Baltimore City was radiant, resonant and rampant with decorations, drumming and patriotism, and some of the Old Timers whose knowledge of national history begins at Bunker Hill and ends most anywhere, came and went in the pleasant belief that the whole demonstration was for their especial entertainment.

Baltimore has an unusually large number of citizens who are practical telegraph operators, many of them now holding prominent and important positions in other business. Among these are: R. B. Campbell, general manager B. & O. R. R.; Thomas Fitzgerald, general superintendent B. &. O. R. R.; John E. Spurrier, division superintendent B. & O. R. R.; Charles E. Ways, general freight agent B. & O. R. R.; B. H. Griswold, general auditor Western Md. R. R.; Theo. Sumwalt, agent Penn. R. R.; T. W. Swank, agent Adams Express; A. L. Gardner, superintendent Consolidated Car Service; B. W. Flack, general manager Standard Oil Company; James Doyle, city editor Baltimore *American;* James McColgan, a prominent attorney; A. Wilson, Jr., superintendent C. & P. Telephone Co.; A. G. Davis, president Viaduct Manufacturing Co., a kinsman and pupil of Professor Morse; Chas. J. McAleese, superintendent fire alarm telegraph; J. B. Yeakle, superintendent Mutual District Telegraph; J. F. Morrison, general manager Fort Wayne Electric Light Co.; J. C. Hiltabidle, transportation manager Western Md. R. R.; Malcolm Hart, private secretary to Bishop Paret; Walter H. Stewart, member of City Council; Louis P. Goldsboro, Commission Merchant.

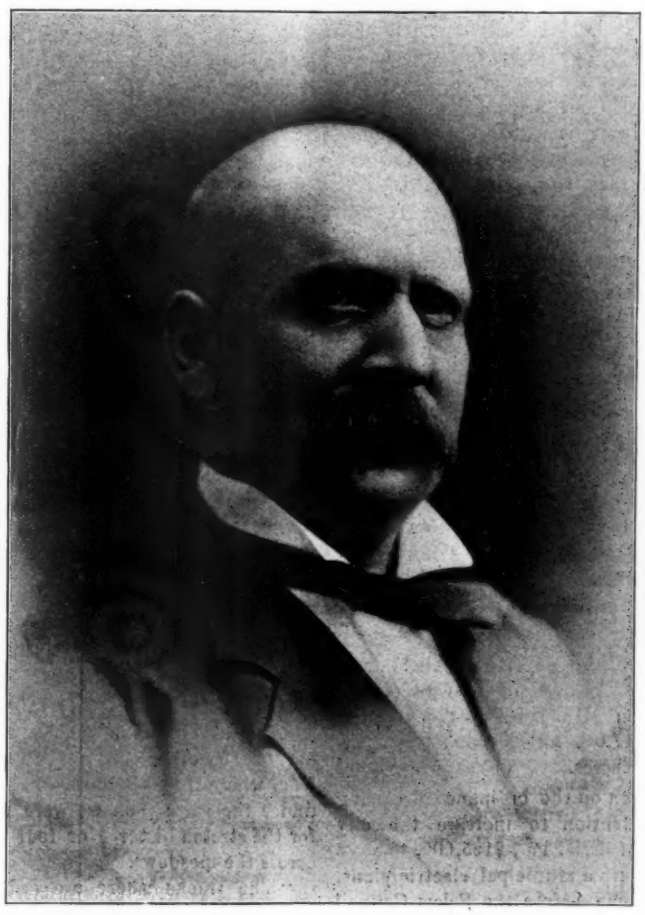
All the arrangements for the reunion were under the direction of

Charles Selden, president of the Old Timers' Association, and general superintendent of the B. & O. R. R. Telegraph, aided by the members of several committees, and no reunion was ever held with greater success or with more pleasure to the participants. There was an unusually large number of ladies among the visitors and they were most courteously and agreeably entertained by Mrs. Selden, Mrs. Yeakle, Mrs. Mattoon, Mrs. Bloxham and Mrs. McLean. There was an efficient committee of gentlemen on entertainment, but every Baltimore telegrapher proved himself to be an accomplished entertainer to the delight of every guest. While business was in progress the ladies were escorted to Fort McHenry, Druid Hill Park and other places of interest, and on Wednesday evening a large party attended Ford's Theater. Many of the visitors arrived on the evening of the 11th, the largest delegation coming in a special Royal Blue palace car by the B. & O. line from New York city. The members of this party were :

W. J. Dealy and family, E. M. Tomlinson and wife, E. C. Cockey, wife and daughter, T. E. Fleming, John Rathbone and wife, J. H. Emerick and wife, J. F. Guthridge, F. W. Jones and wife, R. J. Murphy, G. W. Logan and wife, Joseph Mitchell, W. S. Logue, wife and son, John Brant and wife, W. L. Ives, Joseph Knittle and wife, J. K. Calvert, F. D. Murphy, J. F. Shorey, J. B. Taltavall, A. Winder, W. C. Burton and wife, W. H. Kerner, H. D. Rogers, R. J. Hutchinson, M. W. Rayens, J. H. Bunnell, New York; H. D. Reynolds and wife, Buffalo; C. E. Shelly and wife, Albany; Chas. C. Adams, Philadelphia; E. Ryder, wife and daughter, L. Hempstead and wife, W. H. Babcock, Hartford; E. B. Baker, New Haven; M. R. Hults, Bridgeport; S. J. Gifford, Dunkirk.

R. J. Bloxham, Chas. J. McAleese, J. F. Morrison, Chas. E. Ways, L. Lemon, J. F. Bradt, Geo. Hadley, A. L. Gardner, Edwin F. Baker, A. Wilson, Jr., Theo. Sumwalt, D. P. West, Jas. Doyle, J. B. Yeakle, C. P. Adams, T. W. Swank, B. H. Griswold, R. B. Campbell, T. Fitzgerald, Jno. E. Spurrier, J. C. Hiltabidle, L. A. Burck, Jas. Donnelly, Jno. C. Mattoon, J. R. Johnson, Walter H. Stewart, E. J. Little, C. P. Adams, N. F. Banfiel, Edgar W. Day, T. Cannon, W. W. Eccleston, Malcolm Hart, J. J. G. Riley, J. W. McLean, A. Grape, Louis P. Goldsboro, Wm. Kelley, J. S. Thompson, Jas. McColgan, W. W. Thweatt, Phil. Hess, F. W. Ganger, J. B. Frost, D. D. Kennedy, H. V. Riley, F. Halier, of Baltimore.

Another special car came from Columbus in charge of S. P. Peabody, division superintendent B. & O. R. R., who brought a large delegation with him. The telegraphic headquarters was at the Carrollton Hotel, and the business meetings were held in one of the large parlors fronting on Baltimore street. The Old Timers assembled at 10 A. M. on the 12th, and the meeting was opened by President Selden, who introduced Mayor Ferdinand C. Latrobe. The Mayor, whose father, the late Hon. J. H. B. Latrobe, was a personal friend of Professor Morse, speaking in a personal and official capacity, extended a cordial welcome to the visiting telegraphers and told many interesting incidents connected with the construction and operation of the first line. His father, who was the counsel of the B. & O. R. R. Company at that time, was one morning informed by Mr. McLain, the president of the road, that he had just received a call from Morse, who stated that Congress had granted him an appropriation for building his experimental line and he desired permission to run it along the B. & O. road. McLain said that he had referred Morse to Latrobe, and explained that this was done simply to get rid of the crank. A few days later McLain asked Latrobe if Morse had been to see him and Latrobe replied: "Yes, sir; he fully explained his invention and his plans to me, and I tell you, Mr. McLain, that although you have been Secretary of the United States Treasury and Minister to the Court of St. James and are a man of great ability and distinction, when you and your children are dead and forgotten, the name of Morse will be honored as one of the greatest benefactors the world ever had." It is well known that the elder Latrobe was from that time a faithful friend of Professor Morse, and that his counsel and co-operation were of great assistance in advancing telegraphic enterprise. His son, the Mayor, is also deeply interested in the telegraph and telegraphers, and his friendly and genial talk to the Old Timers was greatly appreciated and enthusiastically responded to.



PRESIDENT E. C. COCKEY, OF THE OLD TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION.

President Selden then delivered the annual address, which will appear in full later.

Mr. Samuel J. Lea, who was Morse's lineman and who dug the trench in which the wire was laid, and Capt. John W. Torsch, the first messenger in the Baltimore office, gave exceedingly interesting accounts of their early experiences and they were subsequently made honorary members of the society. The facts stated by these gentlemen clearly prove that after all that has been recorded concerning the building of the first telegraph line, the accurate history of that event is yet to be written.

Letters and telegrams from absent members were read—one from James D. Reid, dated Bunfermline, Scotland, where he holds the U. S. Consular post. Mr. Reid has several times crossed the Atlantic to attend these telegraph reunions and his enforced absence on this occasion was greatly regretted by all.

Interesting speeches on pertinent topics were made by W. B. Wilson, Jesse H. Bunnell, W. L. Ives, S. P. Peabody, Wm. R. Plum, President Selden and Secretary Dealy.

Amendments to the constitution of the society were made as follows. Changing the name of the organization to The Old Time Telegraphers' and Historical Association; making the eligibility requirement for membership two years' continuous telegraphic service 20 years prior to the date of application, and fixing the dues at one dollar per year. It was decided to hold the next reunion in New York city on the second Wednesday in September, 1895.

In the election of officers the following persons were unanimously chosen.

E. C. Cockey, of New York, president.

R. J. Hutchinson, of New York, vice-president.

Geo. C. Maynard, of Washington, secretary and historian.

Among the persons in attendance in addition to those already mentioned were :

Heber C. Robinson and wife, Camden, N. J.; Geo. A. Burnett, Buffalo; John A. Townsend, Dunkirk; W. J. Bodell, Ft. Monroe; G. E. Rainsford, Mt. Savage, Md.; Wm. R. Plum, J. E. Pettit, E. P. Whitford and John E. Zeublin, Chicago; Wm. B. Wilson, Philadelphia; J. B. Stewart, Elizabeth; C. Wirt White, Richmond; C. W. Jones, New York; Wm. Patterson, Muncie, Ind; A. T. Gould, Cincinnati; S. M. Dunlap, Geo. Cole, Ben. Lloyd and Frank Waddell, Columbus, O.; Morell Marean, Wm. H. Allen, R. G. Callum, Wm. H. Young, F. W. Royce, Geo. C. Maynard, Dr. Wm. M. Ash and A. G. Safford, of Washington, D. C.

On Thursday, the 13th, a free excursion was given by the Baltimore telegraphers to their guests. A special train provided by the Western Maryland Railroad carried about 150 excursionists to Pen Mar at the summit of the Alleghanies just where the boundary line between Pennsylvania and Maryland crosses the range, and a complimentary dinner was served at the Blue Mountain Hotel. On this occasion ex-President Selden acted as toast master and delightful responses to appropriate toasts were made by President Cockey and Messrs. Plum, Burton, Kerner, Wilson, Dealy, Bunnell, Jones and others.

PRESIDENT-ELECT COCKEY.

Edward Cromwell Cockey possesses a wide acquaintance and has an innumerable host of friends who appreciate his many excellent qualities of mind and heart. A native of Baltimore, born in the year 1832, month of September, he comes from one of the oldest families in the State of Maryland. After a career as accountant at Fortress Monroe, Mr. Cockey accepted in 1867 a position in the Western Union service at New York. He remained in this connection, looking after the money accounts and vouchers of the superintendents of the Eastern Division until 1875. The Atlantic and Pacific Telegraph Company being then organized as a rival of the Western Union company, he left the old service to become attached to the new, in the capacity of supply agent, which position he held until November, 1878, when he was made auditor of the same company. In March, 1881, after the consolidation, he was appointed storekeeper at New York of the Western Union Telegraph Company, and a few years later was appointed also to the position of superintendent of supplies, which two positions he now holds.

His position is one of great importance, and he fills it in a manner highly satisfactory to the company.

He has been president of the Magnetic Club for many years. He has also been president of the Institute of Accountants and Bookkeepers of New York city.

That Ten Word Limit.

This is the message the telegraph messenger handed to him :

"Come down as soon as you can. I am dying. KATE."

Eight hours later he arrived at the Summer hotel, to be met on the piazza by Kate herself.

"Why—what did you mean by sending me such a message?" he asked.

"Oh," she gurgled, "I wanted to say that I was dying to see you, but my 10 words ran out and I had to stop."—*Indianapolis Journal.*

Cleveland, Ohio, is to have the honor of entertaining the apostles of light next February. It may be a little cold in this northern city at that time, but we are certain that Messrs. Potter, Lawrence, Hamill and others will make the delegates feel at home and as comfortable as though they were at their own fireside.

TELEPHONE NEWS AND COMMENT.

James B. Warner, of Hagerstown, Md., says he discovered telephony 30 years ago. Next!

Mr. L. A. Herrick, formerly chief inspector at the Rockford, Ill., exchange of the Central Union Telephone Company, has been appointed manager of the exchange at Freeport, Ill.

Considerable rebuilding of the telephone system at Freeport, Ill., is in progress. The new electric street railway will necessitate a common return system for the telephone exchange.

The organizers of the new telephone exchange in Clyde, N. Y., report that they are meeting with the best of success in presenting the claims of their system to the business men of Clyde.

The Central Union Telephone Company are building a copper metallic long distance line between Rockford, Ill., DeKalb, Ill., and points in the Chicago Telephone Company's territory.

The charter of the telephone company to erect and operate a telephone line from Brookhaven, Miss., to Monticello, has been approved and published, and the following officers have been elected: F. F. Becker, president; L. H. Baggett, vice-president; Henry Meyer, secretary; and W. H. Seavey, treasurer.

A. E. Davies, manager of the Central Union Telephone Exchange, of Michigan City, Ind., is reported to have absconded with upward of $600, which was intrusted to him for the purpose of paying a gang of workmen employed by the telephone company in constructing a line between Laporte and Michigan City.

The Interstate Telephone and Telegraph Company, of Frederick, Md., is reported to have secured the exclusive control of the Western magneto telephone, and will commence its canvass at once for subscribers for the Frederick exchange. The company will offer its telephone to the public at $15 per year in residences, $25 per year for business places, and where a business place and a residence are on one line a charge of $35 per year will be made.

The Southern New England Telephone Company had some difficulty with John M. Walker, in the town of Westbrook, Conn., over the erection of poles for stringing their wires. Mr. Walker claimed the poles damaged his premises by passing in front, and the company were willing to pay what Mr. Walker thought was right. He refused to set any price and the county commissioners were appealed to with the result they came to the conclusion there was no damage at all and gave the company permission to erect without regard to Mr. Walker, who got nothing by the operation.

The British Government has at length concluded an agreement with the telephone companies of the United Kingdom whereby the control of the system is vested in the hands of the General Post Office. For the present the State contents itself with the acquisition of the trunk lines, reserving to itself the exclusive right of constructing new lines of this kind, leaving, however, the local exchanges in the hands of their respective companies, subject to State supervision. But this is merely preparatory to the complete absorption by the nation of the whole telephonic system, probably long before the expiration of the licenses of the companies now in existence, which have still 40 years to run. The figure at which the transfer is eventually to be effected is already arranged, and the terms are identical with those on which the trunk lines have been acquired, namely, the cost price, plus 10 per cent of cost of administration.

ELECTRIC LIGHT FLASHES.

Fort Howard, Wis., has contracted for an electric light plant.

The White Plains, N. Y., Gas and Electric Company is expending $35,000 in improving its plant.

A company has been formed and arrangements completed for giving Chagrin Falls, Ohio, electric lights.

The hearing on the petition of the Boston Electric Light Company to issue $900,000 bonds has been adjourned to October 3. There is no opposition.

On November 6 the freeholders of Williamstown, Pa., will vote on the question of increasing the borough debt $12,000 for electric street lighting purposes.

Action on the ordinance declaring the intention to increase the city debt of Erie, Pa., $125,000, to erect and equip a municipal electric plant, will come before the Select Council for final passage at the next meeting.

Pawnee City, Neb., has offered the electric lighting company in that place, after a careful examination, $1,500 for the plant, including lot, building, engine, dynamo and good will. The company declines to sell out for less than $2,000.

The comparative earnings of the Edison Electric Illuminating Company, of New York, for August were as follows:

	1894.	1893.	Increase.
Gross	$91,985.96	$74,559.24	$17,396.72
Net	38,985.37	24,874.78	14,110.59
Eight months:			
Gross	$866,358.64	$765,288.72	$101,069.92
Net	454,857.87	340,674.93	113,682.94

Judge Hanford has appointed Gen. Hazard Stevens and A. A. Phillips receivers for the Olympia, Wash., Light and Power Company, upon the application of the American Loan and Trust Company. The indebtedness is not large, but the stringency of the times has rendered payment of the loan secured by the company impossible.

From New York to Newark, N. J., by Trolley.

"I had occasion the other day," said a citizen to a New York *Sun* reporter, "to go to Newark and I thought I would go by the trolley. I had never been that way and I had an idea it would be fun; I thought we should go bounding across the Newark meadows like a rocking meteor on wheels. As a matter of fact the trip was made in an entirely smooth and decorous manner, but it was not without interest. I bought passage at a little ticket office which stands on the sidewalk in Cortlandt street against the side of the building on the southeast corner of West street. For 10 cents I received two tickets, one entitling me to a ride over the ferry and the other to a ride on the electric cars from Jersey City to Newark.

"We left New York at 2.31 P. M. We started from Jersey City at 2.42 in a large open car in which there were 26 passengers. It is a familiar fact that these cars take only through passengers, but passengers are taken up by outgoing cars anywhere on the line in either terminal city, to be set down anywhere on the line in the other. We had one passenger get aboard the car I was on who wished to get down at a point in Jersey City. The conductor, learning this when he came for the fare, explained that it was a through car only and he got down and waited for another car. We had altogether when we reached the Jersey City limit 37 passengers, having taken up 11.

"On the inner side of the car, toward the other track, there was a wooden bar extending the length of the car, like that on the Third avenue cable cars, so that passengers could not get on or off on that side. Just before leaving Jersey City to strike across the meadows a corresponding bar on the other side was let down from where it had been held in straps under the roof; then we were ready for the stretch of three or four miles across the meadows.

"The tracks there are ordinary railway tracks, the rails laid on sleepers, and the ways stone-ballasted; they run on either side of the plank road, except on the bridges, where they converge and cross by the highways. The cars run slowly on the bridges; elsewhere on the meadow tracks their way is unimpeded. In Jersey City the motorman had held the car in pretty well on curves and let her go right along on straight stretches. I expected that when we got started on the meadows we should fairly hum, and the motorman did open out at a good lively gait, but we ran along with perfect smoothness and without any incident whatever, though it was all interesting to me because it was new. How fast we went here I don't know—pretty fast; but aside from that, the great saving of time is made by keeping going. There are two slow-downs for the bridges, but on the other parts of the meadow road with no passengers to set down or take up, speed can be maintained.

"In Newark the outer rail along the outside of the car was raised again. This car arrived at the Market street station of the Pennsylvania Railroad at 3.24. Time from New York, 53 minutes; time from Jersey City, 42 minutes. Time on the Pennsylvania Railroad by a train scheduled to leave New York at 2.30, from New York to Market street, 36 minutes; from Jersey City 21 minutes. There are trains that make the distance in less time. I stayed on the car to Broad street and got off there, that being the point nearest where I wanted to go. Arrived at Broad street 3.27. Time from Jersey City, 45 minutes, distance from Jersey City about eight and one-half miles. So that the actual speed of car was at the rate of about 12 miles an hour.

"My business was quickly dispatched and I was soon back at the corner of Market and Broad streets, the business center of Newark, and a busy corner it is, too. There at 4.15 P. M. I took a trolley car for New York. We had 17 passengers on this trip. We reached the trolley car station in Jersey City at 4.59. I got a ferry ticket there and crossed by the Desbrosses street Ferry, landing on this side at 5.16, pleased with the experience."

GENERAL NOTES.

The Newburg, N. Y., Electric Railroad Company has leased the Orange Lake line for 50 years. It agrees to pay six per cent on $75,000 of bonds, and five per cent on $100,000 of stock. The road is six miles long.

The Interstate Commerce law is to be invoked in the case of the Rock Creek Electric Street Railway, which runs from Washington into Maryland, where an inn is located. It is charged that guests of the inn are given a special rate.

Colonel H. G. Prout, editor of the *Railroad Gazette*, recently made a trip to England for *Scribner's Magazine* to study the present condition of railway methods and service in that country. He has written two very entertaining articles on the subject, the first of which will appear in the October *Scribner* under the title of "Railroad Travel in England and America." The article will be elaborately illustrated from photographs collected by Mr. Prout, and from drawings by A. B. Frost.

The Lighthouse Board has sent out notice that, during September and October, certain electrical experiments will be conducted by the Board in the vicinity of the Scotland Light vessel off Sandy Hook, N. J. Submarine cables will be laid in close proximity to the light vessel, their location being marked by small floating wooden buoys resembling logs of wood. To avoid fouling buoys and cables, masters are requested not to anchor or pass within 1,000 feet of the lightship. A submarine cable will also be laid from Scotland Light vessel to a landing place on the northeastern point of Sandy Hook, opposite the marine telegraph station of the Western Union Telegraph Company.

MULTIPLE FUSE ARRESTERS.

BY C. S. VAN NUIS.

The function of lightning arresters on electric circuits is well known and appreciated by a large majority of those operating electrical plants having overhead conductors, and but few such plants are now operated through thunder storms without some sort of protection against lightning discharges. Occasionally one finds a station that is always shut down at the approach of a thunder storm, and is not started again until the danger is past; but by this means of protecting electrical apparatus large revenues are annually lost to companies who thus render their plants inoperative many times during the season of storms. The first cost of a full equipment of arresters is seldom the cause of such a state of affairs, for frequently a single stoppage means a loss to the company exceeding the entire cost of arresters.

The usual cause for a station shutting down for protection is due to the failure of some particular type of arrester, which has been tried and found entirely unsuited to the local conditions, and with its failure has oftentimes vanished the confidence of the station manager in any or all arresters, thus leading him to adopt what he considers the only safe course—to shut down for protection.

Lightning arresters differ, as do the circuits they are intended to protect, or according to the ideas of their designers as to the best means of preventing, or rupturing the arc which may follow a lightning discharge across the air gap between the discharge points.

If all circuits were purely metallic and the insulation to ground could be maintained well into the megohms, lightning protection would be a comparatively simple task, for there would then be no tendency towards arcing of the generator current at the discharge gap. Experience teaches us, however, that electric circuits "don't stay put," and that high insulation is rather the exception than the rule on many of them, all of which is very detrimental to the discharge gaps of the arresters.

Wider discharge gaps have been used to avert this trouble; mechanical and magnetic contrivances have been resorted to with varying success; but whenever the discharge gap of any arrester, that is connected to one side of an electric circuit having a "ground" on the other poles is operated upon a static discharge, the discharge points are always more or less injured by the consequent arcing of the generator current. It must, therefore, follow that one pair of discharge points will not remain intact when used on circuits of this class, as at each successive discharge the points are appreciably affected and rendered less sensitive to the passage of the next discharge.

This is particularly true of arresters on single trolley railway circuits, where one side of the circuit is always grounded, and not infrequently a so-called automatic arrester is entirely destroyed by arcing.

In view of the difficulty attending the preservation of the discharge points of any arrester with a small air gap (and arresters must have small gaps to protect the finely wound coils of measuring instruments, as well as armatures and field coils), an idea presented itself that a succession of very sensitive discharge points, one for each discharge, might be made more efficient and reliable for a given number of discharges than any one pair of points could be.

The Ajax arrester, illustrated herewith, is of the latter type and consists chiefly of a porcelain arrester box, with a fibrone cover containing 11 fuse discharges.

The fuse consists of two pieces of No. 26 brass wire, each about three inches long, having a single silk insulation and laid side by side for about one inch, as are consecutive coils in an armature. This one inch lap of the wires offers abundant surface for the discharge gap, which is formed by the two thicknesses of silk, and amounts to little more than .002 of an inch.

Small pellets of a highly insulating wax secure these wires in the above position and a small glass tube is hermetically sealed over this part of the fuse to keep the dischargers clean and dry until used.

The extreme sensitiveness of this part of the apparatus is made possible by its *being called upon to act but once.*

The soft rubber plugs serve to hold the fuse in the corrugated cover of the arrester and the bare ends of the wire project through the cover, ready to be brought into contact with the line and ground terminals.

Into the back of the cover are pressed two strips of metal: one a plain flat strip, to which is connected, by a long clamp, one end of each fuse; the other strip is U shaped, and into it the remaining ends of the fuses project, but do not make contact with it, except as the carbon ball completes the connection.

In Fig. 2 the carbon ball is shown making contact between the top fuse and the U shaped strip, which, when the cover is inserted in the porcelain back of the arrester, will receive metallic connection with the line terminal through the flat spring provided for that purpose in the channel at the right in the porcelain. A similar spring is in the left channel to connect the flat strip in the cover to the ground terminal.

The line and ground terminals and flat contact springs in the porcelain backs are well illustrated in Fig. 3.

With the arrester thus assembled, it will be seen that only the top fuse has connection with the line terminal and, consequently, is the only one that can be operated upon by a lightning discharge. The fuse may, or may not, be destroyed, depending upon the severity of the discharge and the condition of the line. If the line has a high potential and ground return, such as is used on single trolley railway circuits, the static discharge will short-circuit the generator current at the discharge points and the fuse will be completely vaporized by the current following the discharge, which will permit the carbon ball to fall to the next fuse, bringing it into circuit automatically, ready to receive a second discharge.

If a low potential metallic circuit is thus protected, one fuse may take care of several discharges, providing the circuit is perfectly free from grounds. If an accidental ground exists at the time of the discharge, the action will be the same as in the case of the railway circuit with the ground return. Or, if only a partial ground should exist at such time, the destruction of the fuse might not be complete, but the relative conductivity of the contact between the carbon ball and the small brass wire, as compared with the rest of the fuse, is so inferior in the former that the end of the wire supporting the ball is *always* the first to disappear, and is sure to allow the ball to drop and reset the arrester, even though the fuse should be only partially destroyed.

The standard types of arrester are adapted to all currents up to 1,000 volts, whether having metallic or ground return circuits, but for higher potentials fuses with a slightly wider gap should be used.

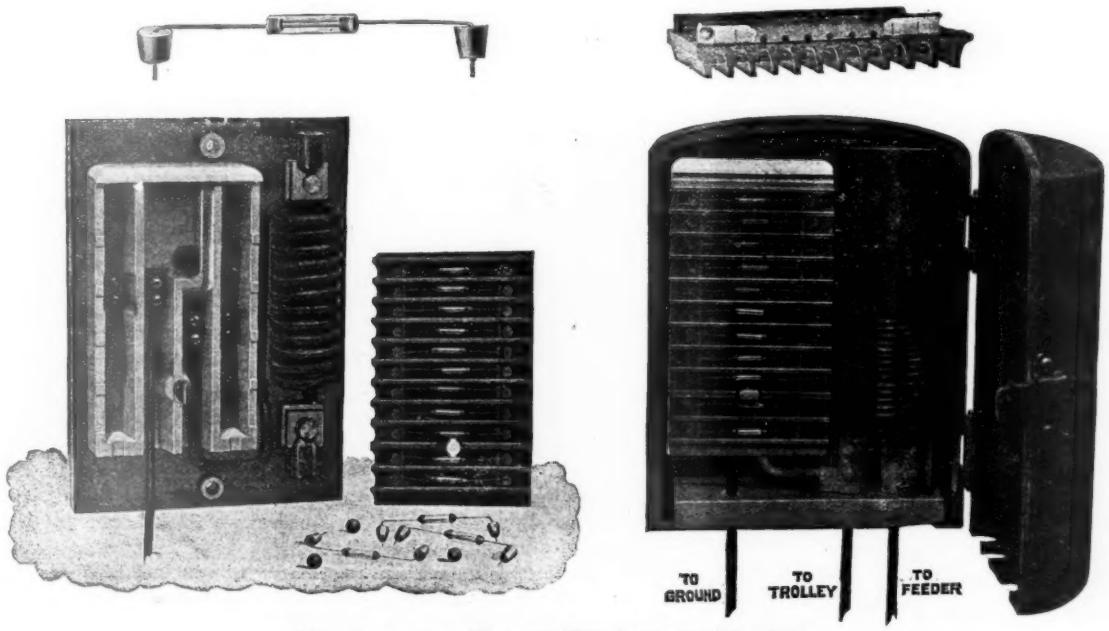
Having reduced, as far as possible, the resistance and impedance in the arrester and its ground connection, another important step toward the protection of the electrical apparatus will be accomplished by inserting a choke coil in the main circuit, so as to divert the lightning from it into the lightning arrester, and thence to the ground. For this purpose, the Ajax arrester is furnished with coils of various capacities to suit the carrying capacity of almost any circuit upon which it may be placed.

For station use, the coil is necessarily of large dimensions, and is usually placed at the back of the switchboard. The arrester may be placed on the front of the board, and the connecting wires led through to it, or it may be put in any other place convenient for inspection. The dimensions of the arrester alone are 7 inches by 4½ inches by 2¼ inches.

The type of arrester used for protecting stationary motors, or isolated plants, is shown in Fig. 3. The regular size is made with a 100 ampere coil, having coil and arrester mounted on a marble slab 7¾ inches by 11 inches by ⅞ inch.

For electric cars or pole line use, the arrester is placed in an asbestos lined iron box, to protect it from the weather or external injury.

The number of arresters required to protect any plant against lightning must be determined by local conditions, such as the frequency and severity of thunder storms, the amount of natural protection afforded the line by adjacent objects, and the nature of the line itself.



FIGS. 1, 2, 3 AND 4.—MULTIPLE FUSE LIGHTNING ARRESTERS.

Advertising.

[*Editorial in New York Sun.*]

The readers of newspapers now comprise practically the whole population, for illiteracy, proportionately trifling in this country, is fast passing away altogether. Hence the opportunity for advertising business furnished by a great newspaper is one of the most valuable features of our advanced civilization. It enables the trader to make his name and his wares familiar to the whole public far and near. As a consequence, many mercantile houses in New York distinguished for their large and persistent advertising in such newspapers are as well known to people in all parts of the Union as the most conspicuous of the public buildings of the town. They have made their names famous by that means, and have won for themselves a distinction as wide as that of men the most prominent in public life. They are recognized everywhere as leaders in their trade.

That is a great opportunity, and it is before every enterprising dealer. Because of it many houses, whose names were unknown a few years ago outside of a small circle of customers who sought their little shops, are now centers of a great trade, celebrated throughout the Union.

The Constant Advertiser.

The constant drop of water
Wears away the hardest stone;
The constant gnaw of Towser
Masticates the toughest bone.
The constant cooing lover
Carries off the blushing maid,
And the constant advertiser
Is the one who gets the trade.

THE HOOSICK RAILWAY.

HOW AN ELECTRIC RAILWAY IN A TOWN OF MODERATE SIZE MAY BE SUCCESSFULLY INSTALLED AND OPERATED—MODERN IDEAS ADOPTED.

(See illustrations on first page.)

In a town or city of moderate population the successful development and operation of an electric railway depends upon at least three important factors:

1. The selection of a locality having a class of people who need and will avail themselves of good rapid transit facilities.

2. The construction and equipment of a road and system on the basis of true economy, *i. e.*, substantial material and workmanship well adapted to the peculiarities of the local conditions, the capitalization and bonded indebtedness being within the limits of sound business investments.

3. Practical, intelligent and economical business management catering to the wants of the traveling public by offering good accommodations and rapid transit, polite employés and all the great and small features that place the public in complete sympathy and harmony with the railway company.

The Hoosick Railway Company, at Hoosick Falls, N. Y., 30 miles northeast of Troy, on the line of the Fitchburg Railroad, has designed and equipped with a full appreciation of the foregoing rules. It is now operating over about five and a half miles of line, the initial regular passenger trips being made on July 13.

Passing through the principal streets of Hoosick, the line extends to North Hoosick and Walloomsac, the intervening territory being well built up with residences of a good class.

The track consists of 48 pound T rail, with the usual form of four bolt angle plate joint. The rails rest upon ties of standard dimensions, two feet between centers, and are bonded with No. 4/0 copper wire. There are several grades worth mentioning: One is on the large radius curve approaching the North Hoosick Bridge and is between 7 per cent and 8 per cent; another of 9 per cent is encountered on Classic street in Hoosick Falls.

The overhead construction consists of both span and bracket work, the former being employed within the city limits of Hoosick Falls. A 2/0 trolley wire is used throughout, paralleled by a main of like capacity. The 2/0 trolley wire is as yet something of an innovation, but in this instance has apparently proven itself to be a step forward, as the results obtained from its use are more than proportionately better than the service offered by the standard No. 0 wire.

Tests of electrical pressure over the entire line give very satisfactory results, the electro-motive force ranging from 475 to 500 volts throughout the system, giving an average of about 487.

Both track and overhead line were built by the Worcester Construction Company, of Worcester, Mass. A new iron bridge, built and erected by the Boston Bridge Company, spans the North Hoosick River at North Hoosick.

The rolling stock consists of three 18 foot closed motor cars, three 10 bench open motor cars, two open trail cars and one snow plow. The motor equipments consist of two 25 horse-power motors per car, two series multiple controllers, a starting rheostat, a fuse block, a lightning arrester and a main cut-out switch. The controllers are of the latest design, embodying a number of novel features. They are giving excellent satisfaction, and are apparently an improvement on all past manufactures.

The motors are of the four pole iron-clad type, with a thoroughly water and dust tight casing to protect all vital parts. The armatures are of the toothed drum type, the coils being machine wound and interchangeable, as are also the coils of the fields. Mica is liberally used in the insulating of all the coils, and those of the fields have a protective winding to guard against mechanical injury. All insulation is tested with a 5,000 volt alternating current.

All parts are readily accessible for purposes of inspection and repairs. The loosening of two bolts allows the lower half of the field to be lowered. The bearings are of Babbitt metal, lubricated with grease. The gears are detachable and run in oil. The shaft is unusually heavy, with extra long journals, and is well protected with steel thrust collars.

The method of suspension is ingenious and entirely novel and fulfills perfectly the conditions necessary for eliminating the rapid deterioration of the rail joints, due to the usual heavy hammer blow. As the motor rides freely on springs adjusting themselves to varying conditions, no part of the machinery is subject to undue strain or shock of any description. The motor is of as light weight as is consistent with extremely strong mechanical construction and maximum efficiency. Apparently, every pound of material has been placed to the utmost advantage.

The motors have operated so perfectly ever since the road was started that there has been no necessity for removing any of the parts, a simple daily cleaning being all that is required.

It is found that in operating the cars for high speed service the motors are comparatively cool when returned to the car house after an 18 hours' continuous run; the heating effect being far less pronounced than during the first week or two of service when a slower schedule was in force.

The motive power is obtained from the station of the Hoosick Falls Electric Light Company, which is located one-half mile from the center of the railway system, the feeder wires being carried on a pole line to the main of the trolley line. The station is driven by water power with an auxiliary steam plant to insure additional reliability in the event of low water or other accident to the water power.

In the station is a 100 kilowatt multipolar generator. Its design is a model of beauty and strength. The field frame is cast in two pieces. The magnets are of the iron-clad type, with pole pieces of soft laminated iron cast into the yoke.

The armature is of large diameter of very low resistance and ample radiating surface. It is of the iron-clad drum type, core being built up of punched plates of the best quality of armature iron. These plates are insulated with enamel and compressed into a solid core. The insulation of the winding is most thorough, being composed of mica combined with fibrous material of great durability. Like that of the motors this insulation is tested with a 5,000 volt alternating current. The machinery as a whole is highly efficient.

The car house is a frame building 36x100 feet with two car pits and planked floor throughout. An extension is made on one side near the front end as a store room and office for the motormen and conductors. A handsome cupola, with flag staff, surmounts the front end of the car house. The car house is 16 feet in the clear under the trusses, thus permitting the trolley poles to assume a

THE FALK TROLLEY WHEEL AND HARP.

nearly vertical position when the cars are stored in the building.

An interesting feature of the electrical station equipment is the Barber electric water wheel regulator. While this apparatus has received full mention heretofore from the technical journals a brief description may prove interesting.

It consists of two sets of solenoids and resistances, one set of which is almost continually in service to meet changes of load, from one up to 50 amperes, while the second set is thrown in to compensate for changes between 50 and 200 amperes. These resistances are thrown into circuit automatically when the load is taken off the line, thus furnishing an artificial load which steadies the water wheel and maintains the speed of the generator constant during all the sudden fluctuations of load peculiar to electric railway service.

The entire equipment of the road, aside from the track and overhead system, was furnished and installed by the Electrical and Mechanical Engineering and Trading Company, of New York. This includes car barn, cars, trucks, motors, generator and switchboard.

The road has been most successful since the first day of starting, the first 30 days' business showing the patronage of 38,114 passengers. As a financial investment there is every promise that the Hoosick railway will be highly satisfactory. This comparatively small road, serving a population of between 9,000 and 10,000, is a most excellent illustration of the possibility of economically installing and operating an electric railway in such a way as to show handsome returns on the investment, even when the actual population of the locality is small.

It has frequently been stated that small roads will not pay, but there can be no question of this character if sound judgment and practical engineering experience are applied, together with an appreciation of, and a readiness to conform to, the needs of the traveling public.

During the early weeks of the operation of the road the round trip was made in 40 minutes, schedule time; but, anticipating any requests on the part of the patrons for a quicker schedule, the management, some days since, reduced the round trip time to 30 minutes. The sudden upward jump in the daily receipts of the road when the new schedule went into effect should prove a most impressive object lesson to managers of small roads everywhere.

Under the present energetic management, a five cent fare prevails throughout. A baseball park and race track have been opened near North Hoosick, and a new excursion and picnic grove has been established near Walloomsac, on the bank of the North Hoosick River.

The Falk Trolley Wheel and Harp.

The accompanying illustration gives an excellent view of the Falk trolley wheel and harp, which is being offered to street railway people by the Central Electric Co., Chicago. W. R. Garton, in charge of their street railway department, considers this a great improvement over other styles of wheels which use graphite or roller bearings. The Falk trolley is constructed with cone bearings so arranged that they adjust themselves automatically to the slight wear. The wheel is at all times kept in perfectly true position so that while it is allowed to revolve with entire freedom, it never rattles or wobbles. An important feature is the "dope" chamber inside the wheel. This carries sufficient lubricant for many miles of travel. No grease or oil is wasted by dripping or leaking; all removable parts are secured by steel cotter pins so that they cannot work loose. The Central Electric Company has some new literature in preparation describing improved railway devices; these circulars will be mailed to everyone interested.

For some days past agents of the New York and New Jersey Telephone Company have visited the various drug stores in Newark, N. J., notifying the proprietors that as soon as their leases expired their places would be made pay stations, and that instruments with a metallic circuit would be used.

STREET RAILWAYS.

CONVENTION ANNOUNCEMENTS GIVING DATE AND PLACE OF MEETING.

THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK.—SEPTEMBER 18.

D. B. Hasbrouck, president, New York city; G. Tracy Rogers, first vice-president, Binghamton; James H. Moffatt, second vice-president, Syracuse; William J. Richardson, secretary and treasurer, Brooklyn.

The next meeting will be held at Syracuse on the third Tuesday in September, 1894.

OHIO STATE TRAMWAY ASSOCIATION.—SEPTEMBER 26.

President, A. E. Lang, Toledo; vice-president, W. J. Kelly, Columbus; secretary and treasurer, J. B. Hanna, Cleveland; Chairman Executive Committee, W. A. Lynch, Canton, O.

Meets at Toledo on the fourth Wednesday in September, 1894.

AMERICAN STREET RAILWAY ASSOCIATION.—ATLANTA, OCTOBER, 17.

Henry C. Payne, president, Milwaukee, Wis.; Wm. J. Richardson, secretary and treasurer, Brooklyn, N. Y.; W. J. Stephenson, first vice-president, Washington, D. C.; J. R. Chapman, second vice-president, Grand Rapids, Mich; Lewis Perrine, third vice-president, Trenton, N. J. Executive Committee, D. F. Longstreet, Denver, Col.; T. H. McLean, Indianapolis, Ind.; Ed. Whittacre, W. Y. Soper, Ottawa, Ont.; and E. S. Goodrich, Hartford, Conn.

Place of next meeting, Atlanta, Georgia, third Wednesday in October, 1894.

SUBJECTS FOR REPORTS AT ATLANTA.

"Can the T Rail be Satisfactorily Used in Paved Streets?" Joel Hurt, president Atlanta Consolidated Street Railway, Atlanta, Ga.; S. Hendrie, manager Wyandotte and Detroit River Railway, Detroit, Mich.; H. J. Crowley, engineer Atlanta Consolidated Street Railway, Atlanta, Ga.

"City and Suburban Electric Railways." E. C. Foster, superintendent Lynn and Boston Railroad, Boston, Mass.

"Mail, Express and Freight Service on Street Railways" R. McCulloch, electrical engineer Citizens' Railway, St. Louis.

"Best Method of Treating Accidents and Complaints." John B. Parsons, general manager West Chicago Street Railroad Company, Chicago.

"Street Car Wheels and Axles." D. S. Cook, electrical engineer Trenton Passenger Railway Company, Trenton, N. J.

"Transfer and Commutation." Rodney Curtis, president Denver Tramways Company, Denver, Col.

"T Rail Construction of the Terre Haute Street Railway Company, Terre Haute, Ind." M. F. Burke, superintendent Terre Haute Street Railway Company, Terre Haute, Ind.

"A Standard Form for Accounts for Street Railways." H. I. Bettis, consulting engineer Atlanta Consolidated Street Railway Company, Atlanta, Ga.

ELECTRIC RAILWAY NOTES.

Peoria, Ill., may have a new street railway.

Fort Howard, Wis., has contracted for a new electric railway.

Baltimore wants an electric railway mail service, and the chances are that she'll get it.

The Pittsburgh, Pa., Chamber of Commerce will insist that Pittsburgh street cars be equipped with safety fenders.

A Chicago capitalist has submitted to the city authorities of Portage, Wis., a proposition for a street railway.

An electric line between New Albany, Ind., and Wyandotte cave is being agitated by the citizens of Corydon and Leavenworth.

The Delaware County and Philadelphia Trolley Company has lost a valuable franchise in Darby borough, Md., by allowing it to expire.

The Chester Traction Company will rebond the road between Chester and Media, Pa. The bonding wire which was put down when the road was built is not large enough.

The syndicate of New York capitalists headed by A. Belmont, backed by $14,000,000, which made a vigorous effort to plant an elevated railroad in Philadelphia, has resolved to surrender its charter.

During a recent and heavy wind storm a large part of the iron work on the new power house of the Nassau Electric Railroad at the foot of Thirty-ninth street, Brooklyn, N. Y., was blown down.

The Youngstown, O., Electric Street Railway Company has sold all its property and franchises to President Arenzel, of the Indianapolis Street Railway, and other capitalists in that city.

The Pennsylvania Traction Company is considering a proposition from a syndicate of Boston bankers to build and equip an electric line from Harrisburg, Pa., to Philadelphia, 103 miles, for $8,000,000, guaranteed speed to be 90 miles an hour.

The success of the Summer resorts along the Eastern coast the present season has to a great extent brought forth the question as to the advisability of an electric line along the coast to connect Watch Hill and Narragansett Pier, R. I.

The street car strike which has been in progress at Youngstown, O., for eight weeks upon all the electric lines in the city, accompanied by a boycott that has seriously affected all kinds of business, was declared off on September 1, and most of the former employés will eventually secure their old positions.

The Chillicothe, O., Electric Railway and Light Company has been sold at sheriff's sale to the General Electric Company, of New York, and Tiffin parties. The road sold for $20,100 and only one bid was made. The road was appraised one month ago at $30,000. It will now be placed in good condition and the line extended nine miles.

The Columbus, O., and Clintonville Electric Railroad has been sold to E. W. Tuller and H. C. Cook. The company has been reorganized and the following officers elected: President, O. W. Aldrich; vice-president, Frank Merion; secretary and superintendent, R. M. Weaver; treasurer, H. C. Cook; Executive Committee, the officers and E. W. Tuller.

At the recent annual meeting of the Pennsylvania Street Railway Association at Reading, the following officers were elected for the ensuing year: President, John A. Rigg, Reading; first vice-president, Robert E. Wright, Allentown; second vice-president, G. A. Greenwood, Pittsburgh; secretary, S. P. Light, Lebanon; treasurer, W. H. Lanius, York; Executive Committee, Chris. L. Magee, Pittsburgh; B. F. Myers, Harrisburg; and J. J. Patterson, Lancaster.

THE PINTSCH GAS LIGHTING SYSTEM

Has been adopted as the STANDARD LIGHT by the Broadway and Third Avenue Cable Lines, of New York City; the North and West Chicago Cable Lines, and the Columbus Central Electric Line, of Columbus, O., also by sixty of the most prominent railways and by the Pullman and Wagner Palace Car Companies in the United States.

It has been the standard lighting system in Europe for many years, and is applied to 55,000 cars in Europe, the United States, South America, India and Australia.

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Boston, S. C. Nightingale & Childs, 134 Pearl St.
Philadelphia, Macan & Co., 1430 Callowhill St.
Baltimore, Wallace & Bro., 482 E. Pratt St.
Washington, Wm. B. Morgan, Builders' Exchange.
Chicago, Kemper & Walch, 208 Lake St.
New Orleans, Delbert Engineering Co.
Memphis, Symmes & Co., 196 Front St.

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MANUFACTURED BY

THE KEASBEY & MATTISON CO.,

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SELLING AGENTS:

Milwaukee, F. Sprinkman, 133 Sycamore St.
St. Louis, F. Bocler, 108 Walnut St.
Detroit, S. P. Conkling, 20 Atwater St., East.
Denver, C. W. Badgley & Co., 18th & Market Sts.
Salt Lake City, Utah & Montana Machinery Co.
Butte City, Mont., R. W. James.
San Francisco, DeSolla & Deussing, 9 California St.

The American Carbon Company, of Dayton, O., whose extensive works are at Noblesville, Ind., has secured a contract to supply the Milwaukee Electric Light Company with 1,000,000 carbons.

The Eastern Electric Cable Company, of Boston, manufacturers of the well-known Clark wires and cables, have purchased a large plot of ground adjoining their present factory and will put up new buildings which will greatly increase their manufacturing facilities.

A Course of Twenty-five lectures, on electrical engineering, by Mr. Max Osterberg, E. E., graduate of Columbia College, will be given on Saturday evenings, beginning October 6, 1894, in the Young Men's Christian Association Building, corner Twenty-third street and Fourth avenue.

The Westinghouse Electric and Manufacturing Company, of Pittsburgh, has received the contract for the extension of the Allegheny, Pa., electric light plant at its bid of $34,095.33. This was not the lowest bid, but the fact that employment would be given to home workmen influenced the committee to award the contract to the Westinghouse company.

A Contract for the completed work for the West Chicago Street Railroad Company has been awarded the National Conduit Manufacturing Company, of New York. This contract will amount to about $75,000. The National Conduit Manufacturing Company feel very much elated over this, as they were brought in direct competition with every style of conduit that is in use to-day.

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ELECTRO DEPOSITION OF METALS,
BY
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A complete treatise on the Electro-Plating and Galvanoplastic Operations, the Deposition of Metals by the contact and immersion processes, the coloring of metals, the methods of Gridding and Polishing, as well as Descriptions of the Electric Elements, Dynamo Electric Machines, Thermo-Piles, and of the materials and processes used in every department of the art.

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